PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2000-205723

(43)Date of publication of application : 28.07.2000

(51)Int.Cl. F25D 11/00

(21)Application number : 11-350189

(22)Date of filing : 09.12.1999

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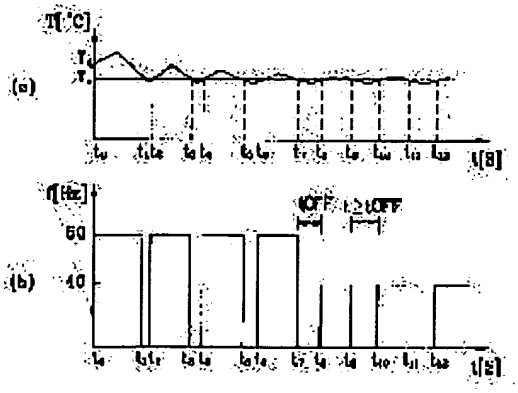
(30)Priority

Priority number : 98 9854126 Priority date : 10.12.1998 Priority country : KR

(54) OPERATION CONTROL METHOD OF INVERTER REFRIGERATOR

(57)Abstract:

PROBLEM TO BE SOLVED: To reduce noises and the consumption of electricity which are caused during the operation of an inverter refrigerator by determining the operation frequency of a compressor motor by detecting the operation pattern of the compressor motor conforming to a load thrown into the refrigerator, and controlling the revolution of the compressor motor by the operation frequency.



SOLUTION: In an initial stage t0, a compressor motor rotates at a revolution number which is equivalent to an operation frequency, 60 Hz, of a high frequency, and the temperature in the refrigerator is lowered, and at a point t1 wherein the detected temperature in the refrigerator is lower than a set temperature, the rotation of the compressor motor is stopped. Then, as time passes, when the detected temperature in the refrigerator becomes higher than the set temperature again, from a point t2, the compressor motor rotates again. At this time, a microcomputer compares an off time t1-t2 of the compressor motor and a compressor motor off time tOFF which is set in advance, in order to determine the operation frequency of the compressor motor, and then, by judging that a load

amount in the refrigerator is large, makes the motor rotate. By this constitution, operation noises and the consumption electricity can be reduced.

LEGAL STATUS

[Date of request for examination]	09.12.1999
[Date of sending the examiner's decision of rejection]	17.04.2001
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]	
[Date of final disposal for application]	
[Patent number]	3429238
[Date of registration]	16.05.2003
[Number of appeal against examiner's decision of rejection]	2001-12398
[Date of requesting appeal against examiner's decision of rejection]	16.07.2001
[Date of extinction of right]	

* NOTICES *

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the operation-control approach of an inverter refrigerator, in detail, detects ON / off pattern of a compressor motor, determines the operation frequency of a compressor motor, and relates to the operation-control approach of the inverter refrigerator which controls rotation of a compressor motor by this operation frequency.
[0002]
[Description of the Prior Art] The freezer compartment 1 and cold storage 15 for storing food in predetermined space in a common inverter refrigerator, as shown in drawing 3 R> 3, Whenever [frozen room temperature / which detects the temperature in these freezer compartments 1 and cold storage 15, respectively] A detector 3 and the cold storage thermometric element 11, The compressor 13 which the detection temperature in a warehouse is inputted from a detector 3 and the cold storage thermometric element 11 whenever [these refrigeration room temperature], and is controlled by the microcomputer (not shown), By the evaporator 7 to which the refrigerant of low-temperature low voltage which was connected with this compressor 13 through piping, and was transmitted through this piping is changed in the shape of a gas, and control of said microcomputer It had the fan motor 5 and damper (damper) which supply the cold generated from said evaporator 7 to a freezer compartment 1 and cold storage 15, respectively, and was constituted.
[0003] And it sets to the control device of the conventional inverter refrigerator. The key input section 21 which sets up the temperature of a freezer compartment 1 and cold storage 15 as shown in drawing 4 , The cold storage thermometric element 11 which detects a detector 3 and the temperature in said cold storage 15 whenever [frozen room temperature / which detects the temperature in said freezer compartment 1], The compressor mechanical component 27 which controls the drive of a compressor 13, and the inverter mechanical component 25 which controls the drive of an inverter, The fan motor / damper mechanical component 23 which controls the drive of a fan motor and a damper, With said key input section 21, whenever [said frozen room temperature] A detector 3 and said cold storage thermometric element 11, since -- each signal outputted was inputted, and it had the microcomputer 29 which outputs a control signal to said compressor mechanical component 27, said inverter mechanical component 25, and said the fan motor / damper mechanical component 23, respectively, and was constituted.
[0004] Thus, it is as follows if it explains to the operation-control approach of the driving device of the constituted conventional inverter refrigerator using drawing 5 and drawing 6 . First, as shown in drawing 5 , the operation frequency f for controlling a compressor motor by the temperature gradient TD between Ts(es) the detection temperature Td in a warehouse and whenever [warehouse inside installation constant temperature] is determined, explore, and it is stored in a table (ST1). When the temperature in cold storage is detected from the cold storage thermometric element 11 and it outputs to a microcomputer 29, this microcomputer 29 Since the temperature in said detected cold storage and the temperature in the cold storage set up beforehand are measured and a control signal is outputted to a fan

motor / damper mechanical component 23,. said damper 9 operates and the temperature of cold storage is adjusted.
[0005] On the other hand, if a detector 3 detects the temperature in a freezer compartment 1 and outputs to a microcomputer 29 whenever [frozen room temperature], this microcomputer 29 will output the control signal which measures said temperature of the detected frozen interior of a room, and whenever [frozen room temperature / which was set up beforehand], determines the operation frequency of the motor of a compressor 13, and has the this determined operation frequency to the inverter mechanical component 25.
[0006] that is, it was shown in drawing 6 (a) -- as -- a user -- whenever [warehouse internal temperature] -- Ts -- 0 degree C -- setting up (ST2) -- said microcomputer 29 makes the rotational frequency applicable to the maximum operation frequency of 75Hz rotate compressor 13 motor between predetermined time t1 (ST3) Then, the detection temperature Td in a warehouse at which said microcomputer 29 was detected from the detector 3 whenever [frozen room temperature], As it indicated drawing 6 (b) that ** TD, for example, a temperature gradient, was 1 degrees C or more from said probe table created beforehand in quest of the temperature gradient TD between Ts(es) (ST4) whenever [warehouse inside installation constant temperature] The compressor motor between predetermined time t1-t2 is rotated at the rotational frequency which asks for the operation frequency of 60Hz applicable to said 1-degree C temperature gradient, and corresponds to the this determined operation frequency of 60Hz.
[0007] thus, while the motor of a compressor operates, said microcomputer 29 repeats the process in_which said temperature gradient TD is searched for, and while it continues the process in_which a compressor motor is rotated at the rotational frequency which corresponds the operation frequency applicable to this temperature gradient TD to said operation frequency which was created beforehand, and which explored, asked from the table and was this determined (ST5), a fan-motor mechanical component is controlled and it rotates a fan motor.
[0008] Thus, whenever [warehouse internal temperature / which was set up by the user] is maintained, and an inverter refrigerator is operated.
[0009]
[Problem(s) to be Solved by the Invention] It is alike and sets to the operation-control approach of such a conventional inverter refrigerator. being appropriate -- The burden set up by the burden and user who are supplied in a refrigerator is followed. Since the rotational frequency of a compressor motor is determined only based on the operation frequency (beforehand set as the probe table) which is not concerned with the temperature which should actually be maintained but corresponds to the temperature gradient TD between Ts(es) the detection temperature Td in a warehouse, and whenever [warehouse inside installation constant temperature], The noise generated at the time of actuation of a compressor was loud, and there was an inconvenient point that consumption of power was large.
[0010] That is, temperature is high, magnitude is large, and if a compressor motor operates and the temperature in a refrigerator is reduced to a load with many amounts, the temperature of said load will decrease gradually from the method side of outside. As for this microcomputer, a compressor motor will be stopped, if the temperature by the side of a way is detected from a thermometric element outside said load which becomes being the same as that of said user laying temperature and it outputs to a microcomputer, before the internal temperature of said load descends to the temperature set up by the user at this time.
[0011] And when the hot heat which lurks in said load is gradually transmitted outside according to the passage of time and whenever [warehouse internal temperature] went up, a thermometric element detects whenever [this warehouse internal temperature], and outputs it to a microcomputer, and this microcomputer measured said detection temperature in a warehouse, and user laying temperature, and was rotating the compressor motor again on the operation frequency applicable to this temperature gradient.
[0012] Moreover , since the operation frequency of a compressor motor be determined based on the detection temperature in a warehouse from a thermometric element , without take into consideration the

internal heating value of the food throw in in a refrigerator , also when a refrigerator door be open and closed without an injection of the food to a refrigerator , it came to rotate the compressor motor with the maximum frequency , and there be an inconvenient point that the noise of operation and power [exhausting] increased .

[0013] Furthermore, since when user laying temperature is set up highly should have made the compressor motor turn on / turn off on a low operation frequency, power consumption was large, and there was [an inconvenient point that there was a possibility that food may deteriorate] when it was going to maintain low temperature even inside the thrown-in food, and necessary [of the long time] is carried out and it keeps food for a long period of time. Then, this invention was made in view of such a conventional technical problem, and according to the load thrown in in the refrigerator, the purpose detects the pattern of a compressor motor of operation, determines the operation frequency of a compressor motor, and is to offer the operation-control approach of the inverter refrigerator which controls rotation of a compressor motor by this operation frequency.

[0014]

[Means for Solving the Problem] In the operation-control approach of the inverter refrigerator applied to this invention in order to attain such a purpose The 1st step which operates a compressor motor with the control signal which has the predetermined operation frequency fa which detected closing motion of a refrigerator door and was set up beforehand, The 2nd step which detects ON / off pattern of a compressor motor, and determines the operation frequency fd of a compressor motor at the time of actuation of a compressor motor, and the 3rd step which operates a compressor motor with the control signal which has said determined operation frequency fd are performed one by one.

[0015] And it sets to the operation-control approach of the inverter refrigerator concerning this invention. If Ts is compared the detection temperature Td in a warehouse, and whenever [warehouse inside installation constant temperature] and said detection temperature Td in a warehouse is [whenever / said warehouse inside installation constant temperature] lower than Ts The phase of stopping actuation of a compressor motor and detecting the off time amount td of said compressor motor, If Ts is compared said detection temperature Td in a warehouse, and whenever [warehouse inside installation constant temperature] and said detection temperature Td in a warehouse is [whenever / said warehouse inside installation constant temperature] higher than Ts The off time amount td of said detected compressor motor, and the compressor off time amount tOFF set up beforehand If the off time amount td of the phase to compare, and a this comparison result and said detected compressor motor is shorter than said compressor off time amount tOFF set up beforehand If the off time amount td of the phase of rotating a compressor motor on the operation frequency fH of a RF, and a said comparison result and said detected compressor motor is longer than said compressor off time amount tOFF set up beforehand It carries out by including the phase of rotating a compressor motor on the operation frequency fL of low frequency.

[0016]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained using a drawing. Since the control device of the inverter refrigerator concerning this invention is constituted like the control device of the conventional inverter refrigerator shown in drawing 4 , it omits explanation. And it sets to the operation-control approach of the inverter refrigerator concerning this invention. as shown in drawing 1 , a power source supplies an inverter refrigerator -- having (ST10) -- A user sets up Ts (drawing 2 (a)) using the key input section whenever [OFF time amount / of a compressor motor / tOFF, and warehouse internal temperature]. After ** (ST11), Closing motion of a refrigerator door is detected from a microcomputer 29. ** (ST12), The control signal applicable to the operation frequency fH (it is 60Hz as shown in drawing 2 (b)) of the RF set up beforehand is outputted to the inverter mechanical component 25, and a compressor motor is rotated at the rotational frequency applicable to said high frequency fH (ST13).

[0017] In order to ** whenever [warehouse internal temperature] low, while a compressor motor operates, then, a microcomputer 29 The detection temperature td in a warehouse detected from the thermometric element, and whenever [warehouse inside installation constant temperature] ts, If it

compares (ST14) and ** and said detection temperature td in a warehouse are [whenever / warehouse inside installation constant temperature] higher than ts, the off time amount td of the detected compressor motor is compared with said off time amount tOFF of a compressor motor set up beforehand (ST15). (In order to operate continuously until a compressor motor rotates on the operation frequency of a RF in early stages and it becomes lower than whenever [warehouse inside installation constant temperature] at this time, the off time amount td of the compressor motor which set up so that the off time amount td of a compressor motor might not be compared with said off time amount tOFF of a compressor motor set up beforehand, or was detected is set as "0") .

[0018] If the off time amount td of said comparison result and the detected compressor motor is shorter than the off time amount tOFF of said compressor motor set up beforehand, a compressor motor will be rotated on the operation frequency fH of a RF (ST16), and if the off time amount td of the detected compressor motor is longer than the off time amount tOFF of said compressor motor set up beforehand, a compressor motor will be rotated on the operation frequency fL of low frequency (ST17).

[0019] Thus, when a compressor motor operates, said microcomputer 29 compares ts the detection temperature td in a warehouse detected from the thermometric element, and whenever [warehouse inside installation constant temperature], and if said detection temperature td in a warehouse is [whenever / warehouse inside installation constant temperature] lower than ts, it will measure the time amount td which is made to turn off rotation of a compressor motor (ST18) and by which said compressor motor was turned off (ST19).

[0020] and the passage of time -- following -- whenever [said warehouse internal temperature] -- whenever [warehouse internal temperature / of a user setup of Td] -- more than Ts -- going up (ST14) -- The off time amount td of the compressor motor measured by before at that time, and the off time amount tOFF of the compressor motor set up beforehand It compares, and if the off time amount td of said measured compressor motor is longer than the off time amount tOFF of said compressor motor set up beforehand, a compressor motor will be rotated on the operation frequency fL of low frequency (ST17).

[0021] That is, as shown in drawing 2 (a) and (b), to t0, a compressor motor rotates at the rotational frequency applicable to the operation frequency of 60Hz of a RF, makes whenever [warehouse internal temperature] low, and when the detection temperature in a warehouse is lower than laying temperature, it suspends rotation of a compressor motor by t1 the first stage. then -- if whenever [warehouse internal temperature] becomes higher than laying temperature again according to the passage of time -- Time t -- a compressor motor rotates again from 2. At this time, said microcomputer 29 In order to determine the operation frequency of a compressor motor, the off time amount t1-t2 of said compressor motor, Since the off time amount t1-t2 of said compressor motor is shorter than the compressor off time amount tOFF after comparing the compressor off time amount tOFF set up beforehand, it judges that the burden in a refrigerator is large, and a motor is rotated at the rotational frequency which corresponds to the operation frequency of 60Hz of a RF again.

[0022] Thus, said microcomputer 29 If the off time amount t1-t2 of the compressor motor detected, t3-t4, and t5-t6 are shorter than the off time amount tOFF of the compressor motor set up beforehand A compressor motor is rotated on the operation frequency of 60Hz of a RF, and a compressor motor is rotated on the operation frequency of 40Hz of low frequency from t7 the time of becoming beyond the off time amount tOFF of the compressor motor by which the off time amount td of the compressor motor detected was set up beforehand.

[0023]

[Effect of the Invention] In the operation-control approach of the inverter refrigerator applied to this invention as explained above In order to detect the pattern (off time amount of a compressor motor) of a compressor motor of operation, to determine the operation frequency of a compressor motor and to control rotation of a compressor motor by the this determined operation frequency according to the load thrown in in the refrigerator, In consideration of the load in a warehouse, a compressor motor is controlled to an optimum state, and it is effective in the ability to reduce consumption of the noise and power which are generated at the time of actuation of an inverter refrigerator.

[Translation done.]

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CLAIMS

[Claim(s)]
[Claim 1] The 1st step which operates a compressor motor with the control signal which has the predetermined operation frequency (fa) which detected closing motion of a refrigerator door and was set up beforehand, The 2nd step which detects ON / off pattern of a compressor motor, and determines the operation frequency (fd) of a compressor motor at the time of actuation of a compressor motor, The operation-control approach of the inverter refrigerator characterized by performing the 3rd step which operates a compressor motor with the control signal which has said determined operation frequency (fd) one by one.
[Claim 2] The operation-control approach of the inverter refrigerator according to claim 1 characterized by carrying out by including the phase of setting up (Ts) whenever [off time amount / of a compressor motor / (tOFF), and warehouse internal temperature / of a user request], in said 1st step.
[Claim 3] ON / off pattern of said compressor motor are the operation-control approach of the inverter refrigerator according to claim 1 characterized by being the off time amount (td) of a compressor motor in case a compressor motor does not operate.
[Claim 4] In said 2nd step, the detection temperature in a warehouse (Td), and whenever [warehouse inside installation constant temperature] (Ts), If it compares and said detection temperature in a warehouse (Td) is [whenever / said warehouse inside installation constant temperature] lower than (Ts) The phase of stopping actuation of a compressor motor and detecting the off time amount (td) of said compressor motor, (Ts) is compared said detection temperature in a warehouse (Td), and whenever [warehouse inside installation constant temperature]. If said detection temperature in a warehouse (Td) is [whenever / said warehouse inside installation constant temperature] higher than (Ts) The off time amount (td) of said detected compressor motor, and the compressor off time amount set up beforehand (tOFF), If the off time amount (td) of the phase to compare, and a this comparison result and said detected compressor motor is shorter than said compressor off time amount (tOFF) set up beforehand The phase of determining the operation frequency (fd) of a compressor motor as the operation frequency (fH) of a RF, If the off time amount (td) of said comparison result and said detected compressor motor is longer than said compressor off time amount (tOFF) set up beforehand The operation-control approach of the inverter refrigerator according to claim 1 characterized by carrying out by including the phase of determining the operation frequency (fd) of a compressor motor as the operation frequency (fL) of low frequency.
[Claim 5] The operation frequency (fH) of said RF is the operation-control approach of the inverter refrigerator according to claim 4 characterized by being 60Hz.
[Claim 6] The operation frequency (fL) of said low frequency is the operation-control approach of the inverter refrigerator according to claim 4 characterized by being 40Hz.
[Claim 7] Said predetermined operation frequency (fa) is the operation-control approach of the inverter refrigerator according to claim 1 characterized by being 60Hz.
[Claim 8] If (Ts) is compared the detection temperature in a warehouse (Td), and whenever [warehouse inside installation constant temperature] and said detection temperature in a warehouse (Td) is

[whenever / said warehouse inside installation constant temperature] lower than (Ts) The phase of stopping actuation of a compressor motor and detecting the off time amount (td) of said compressor motor, (Ts) is compared said detection temperature in a warehouse (Td), and whenever [warehouse inside installation constant temperature]. If said detection temperature in a warehouse (Td) is [whenever / said warehouse inside installation constant temperature] higher than (Ts) The off time amount (td) of said detected compressor motor, and the compressor off time amount set up beforehand (tOFF), If the off time amount (td) of the phase to compare, and a this comparison result and said detected compressor motor is shorter than said compressor off time amount (tOFF) set up beforehand If the off time amount (td) of the phase of rotating a compressor motor on the operation frequency (fH) of a RF, and a said comparison result and said detected compressor motor is longer than said compressor off time amount (tOFF) set up beforehand The operation-control approach of the inverter refrigerator characterized by carrying out by including the phase of rotating a compressor motor on the operation frequency (fL) of low frequency.

[Claim 9] The operation-control approach of the inverter refrigerator according to claim 8 characterized by carrying out by including the phase of setting up beforehand (Ts) and the off time amount (tOFF) of a compressor motor whenever [warehouse internal temperature / of a user request].

[Claim 10] The operation-control approach of the inverter refrigerator according to claim 8 characterized by carrying out by detecting closing motion of a refrigerator door and including further the phase of rotating a compressor motor on the operation frequency (fH) of a RF.

[Claim 11] The operation frequency (fH) of said RF is the operation-control approach of the inverter refrigerator according to claim 8 characterized by being 60Hz.

[Claim 12] The operation frequency (fL) of said low frequency is the operation-control approach of the inverter refrigerator according to claim 8 characterized by being 40Hz.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the flow chart which showed the operation-control approach of the inverter refrigerator concerning this invention.
[Drawing 2] (a) is the graph which showed change of the detection temperature in a warehouse according to actuation of the compressor motor by the operation-control approach of the inverter refrigerator concerning this invention, and (b) is the graph which showed the operation frequency of the compressor motor by the operation-control approach of the inverter refrigerator concerning this invention.
[Drawing 3] It is the outline sectional view having shown the configuration of a common inverter refrigerator.
[Drawing 4] It is the block diagram having shown the configuration of the control device of a common inverter refrigerator.
[Drawing 5] It is the flow chart which showed the operation-control approach of the conventional inverter refrigerator.
[Drawing 6] (a) is the graph which showed the temperature gradient of a between the detection temperature in a warehouse according to actuation of the conventional compressor motor, and whenever [warehouse inside installation constant temperature], and (b) is the graph which showed the operation frequency of the compressor motor corresponding to the temperature gradient of drawing 6 (a).
[Description of Notations]
1 -- Freezer compartment
3 -- It is a detector whenever [frozen room temperature].
5 -- Fan motor
7 -- Evaporator
9 -- Damper
11 -- Cold storage thermometric element
13 -- Compressor
15 -- Cold storage
21 -- Key input section
23 -- A fan motor / damper mechanical component
25 -- Inverter mechanical component
27 -- Compressor mechanical component
29 -- Microcomputer

[Translation done.]

(19)日本国特許庁（ＪＰ）　(12)公開特許公報（Ａ）　(11)特許出願公開番号
特開2000－205723
（P2000－205723A）
(43)公開日　平成12年７月28日(2000.7.28)

(51)Int.Cl.⁷	識別記号	ＦＩ	テーマコード（参考）
Ｆ２５Ｄ　11/00	１０１	Ｆ２５Ｄ　11/00	１０１Ｂ

審査請求　有　　請求項の数12　ＯＬ　（全６頁）

(21)出願番号　特願平11－350189

(22)出願日　平成11年12月９日(1999.12.9)

(31)優先権主張番号　５４１２６／１９９８
(32)優先日　平成10年12月10日(1998.12.10)
(33)優先権主張国　韓国（ＫＲ）

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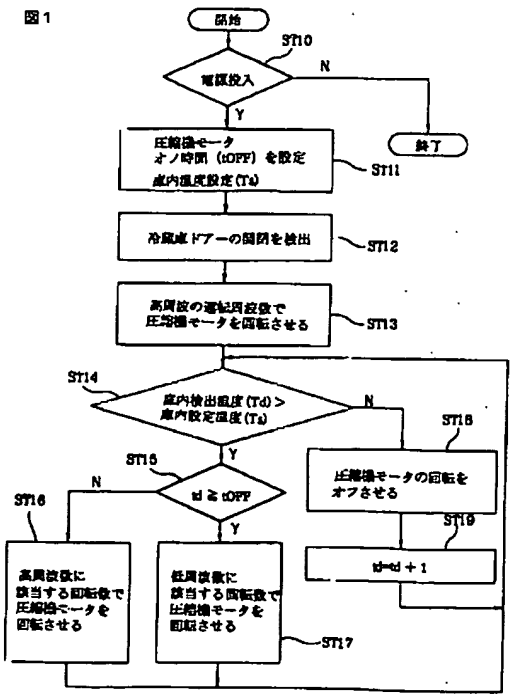
(54)【発明の名称】　インバータ冷蔵庫の運転制御方法

(57)【要約】
【課題】　圧縮機モータのオン／オフパターンを検出して圧縮機モータの運転周波数を決定し、該運転周波数で圧縮機モータの回転を制御するインバータ冷蔵庫の運転制御方法を提供する。
【解決手段】　冷蔵庫ドアーの開閉を検出して予め設定された所定の運転周波数（ｆａ）を有する制御信号で圧縮機モータを動作させる第１段階と、圧縮機モータの動作時に、圧縮機モータのオン／オフパターンを検出して圧縮機モータの運転周波数（ｆｄ）を決定する第２段階と、前記決定された運転周波数（ｆｄ）を有する制御信号で圧縮機モータを動作させる第３段階と、を順次行う。

図１



【特許請求の範囲】
【請求項１】　冷蔵庫ドアーの開閉を検出して予め設定された所定の運転周波数（ｆａ）を有する制御信号で圧縮機モータを動作させる第１段階と、圧縮機モータの動作時に、圧縮機モータのオン／オフパターンを検出して圧縮機モータの運転周波数（ｆｄ）を決定する第２段階と、
前記決定された運転周波数（ｆｄ）を有する制御信号で圧縮機モータを動作させる第３段階と、を順次行うことを特徴とするインバータ冷蔵庫の運転制御方法。
【請求項２】　前記第１段階では、圧縮機モータのオフ時間（ｔＯＦＦ）と、使用者所望の庫内温度（Ｔｓ）と、を設定する段階を包含して行うことを特徴とする請求項１に記載のインバータ冷蔵庫の運転制御方法。
【請求項３】　前記圧縮機モータのオン／オフパターンは、圧縮機モータが動作しないときの圧縮機モータのオフ時間（ｔｄ）であることを特徴とする請求項１に記載のインバータ冷蔵庫の運転制御方法。
【請求項４】　前記第２段階では、庫内検出温度（Ｔｄ）と、庫内設定温度（Ｔｓ）と、を比較して、前記庫内検出温度（Ｔｄ）が前記庫内設定温度（Ｔｓ）よりも低いと、圧縮機モータの動作を停止させ、前記圧縮機モータのオフ時間（ｔｄ）を検出する段階と、
前記庫内検出温度（Ｔｄ）と、庫内設定温度（Ｔｓ）と、を比較して、前記庫内検出温度（Ｔｄ）が前記庫内設定温度（Ｔｓ）よりも高いと、前記検出された圧縮機モータのオフ時間（ｔｄ）と、予め設定された圧縮機オフ時間（ｔＯＦＦ）と、を比較する段階と、
該比較結果、前記検出された圧縮機モータのオフ時間（ｔｄ）が、前記予め設定された圧縮機オフ時間（ｔＯＦＦ）よりも短いと、圧縮機モータの運転周波数（ｆｄ）を高周波の運転周波数（ｆＨ）に決定する段階と、
前記比較結果、前記検出された圧縮機モータのオフ時間（ｔｄ）が、前記予め設定された圧縮機オフ時間（ｔＯＦＦ）よりも長いと、圧縮機モータの運転周波数（ｆｄ）を低周波の運転周波数（ｆＬ）に決定する段階と、を包含して行うことを特徴とする請求項１に記載のインバータ冷蔵庫の運転制御方法。
【請求項５】　前記高周波の運転周波数（ｆＨ）は、６０Ｈｚであることを特徴とする請求項４に記載のインバータ冷蔵庫の運転制御方法。
【請求項６】　前記低周波の運転周波数（ｆＬ）は、４０Ｈｚであることを特徴とする請求項４に記載のインバータ冷蔵庫の運転制御方法。
【請求項７】　前記所定の運転周波数（ｆａ）は、６０Ｈｚであることを特徴とする請求項１に記載のインバータ冷蔵庫の運転制御方法。
【請求項８】　庫内検出温度（Ｔｄ）と、庫内設定温度（Ｔｓ）と、を比較して、前記庫内検出温度（Ｔｄ）が前記庫内設定温度（Ｔｓ）よりも低いと、圧縮機モータの動作を停止させ、前記圧縮機モータのオフ時間（ｔｄ）を検出する段階と、
前記庫内検出温度（Ｔｄ）と、庫内設定温度（Ｔｓ）と、を比較して、前記庫内検出温度（Ｔｄ）が前記庫内設定温度（Ｔｓ）よりも高いと、前記検出された圧縮機モータのオフ時間（ｔｄ）と、予め設定された圧縮機オフ時間（ｔＯＦＦ）と、を比較する段階と、
該比較結果、前記検出された圧縮機モータのオフ時間（ｔｄ）が、前記予め設定された圧縮機オフ時間（ｔＯＦＦ）よりも短いと、高周波の運転周波数（ｆＨ）で圧縮機モータを回転させる段階と、
前記比較結果、前記検出された圧縮機モータのオフ時間（ｔｄ）が、前記予め設定された圧縮機オフ時間（ｔＯＦＦ）よりも長いと、低周波の運転周波数（ｆＬ）で圧縮機モータを回転させる段階と、を包含して行うことを特徴とするインバータ冷蔵庫の運転制御方法。
【請求項９】　使用者所望の庫内温度（Ｔｓ）と、圧縮機モータのオフ時間（ｔＯＦＦ）と、を予め設定する段階を包含して行うことを特徴とする請求項８に記載のインバータ冷蔵庫の運転制御方法。
【請求項１０】　冷蔵庫ドアーの開閉を検出して、高周波の運転周波数（ｆＨ）で圧縮機モータを回転させる段階を更に包含して行うことを特徴とする請求項８に記載のインバータ冷蔵庫の運転制御方法。
【請求項１１】　前記高周波の運転周波数（ｆＨ）は、６０Ｈｚであることを特徴とする請求項８に記載のインバータ冷蔵庫の運転制御方法。
【請求項１２】　前記低周波の運転周波数（ｆＬ）は、４０Ｈｚであることを特徴とする請求項８に記載のインバータ冷蔵庫の運転制御方法。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、インバータ冷蔵庫の運転制御方法に係るもので、詳しくは、圧縮機モータのオン／オフパターンを検出して圧縮機モータの運転周波数を決定し、該運転周波数で圧縮機モータの回転を制御するインバータ冷蔵庫の運転制御方法に関するものである。
【０００２】
【従来の技術】一般のインバータ冷蔵庫においては、図３に示したように、所定の空間に食品を貯蔵するための冷凍室１及び冷蔵室１５と、それら冷凍室１及び冷蔵室１５内の温度をそれぞれ検出する冷凍室温度検出器３及び冷蔵室温度検出器１１と、それら冷凍室温度検出器３及び冷蔵室温度検出器１１から庫内の検出温度が入力され、マイクロコンピュータ（図示されず）により制御される圧縮機１３と、該圧縮機１３に配管を介して連結され、該配管を通して伝達された低温低圧の冷媒を気体状に変化させる蒸発器７と、前記マイクロコンピュータの制御により、前記蒸発器７から発生する冷気を冷凍室１

及び冷蔵室１５にそれぞれ供給するファンモータ５及びダンパ（damper）と、を備えて構成されていた。

【０００３】そして、従来のインバータ冷蔵庫の運転制御装置においては、図４に示したように、冷凍室１及び冷蔵室１５の温度を設定するキー入力部２１と、前記冷凍室１内の温度を検出する冷凍室温度検出器３と、前記冷蔵室１５内の温度を検出する冷蔵室温度検出器１１と、圧縮機１３の駆動を制御する圧縮機駆動部２７と、インバータの駆動を制御するインバータ駆動部２５と、ファンモータ及びダンパの駆動を制御するファンモータ／ダンパ駆動部２３と、前記キー入力部２１と、前記冷凍室温度検出器３と、前記冷蔵室温度検出器１１と、から出力される各信号を入力して、前記圧縮機駆動部２７、前記インバータ駆動部２５及び前記ファンモータ／ダンパ駆動部２３にそれぞれ制御信号を出力するマイクロコンピュータ２９と、を備えて構成されていた。

【０００４】このように構成された従来のインバータ冷蔵庫の運転装置の運転制御方法に対し、図５及び図６を用いて説明すると次のようである。先ず、図５に示したように、庫内検出温度Ｔｄと庫内設定温度Ｔｓ間の温度差ＴＤにより圧縮機モータを制御するための運転周波数ｆが決定されて探り表に格納され（ＳＴ１）、冷蔵室温度検出器１１から冷蔵室内の温度を検出してマイクロコンピュータ２９に出力すると、該マイクロコンピュータ２９は、前記検出された冷蔵室内の温度と予め設定された冷蔵室内の温度と、を比較して、ファンモータ／ダンパ駆動部２３に制御信号を出力するため、前記ダンパ９が動作して冷蔵室の温度が調節される。

【０００５】一方、冷凍室温度検出器３が冷凍室１内の温度を検出してマイクロコンピュータ２９に出力すると、該マイクロコンピュータ２９は、前記検出された冷凍室内の温度と、予め設定された冷凍室温度と、を比較して圧縮機１３のモータの運転周波数を決定し、該決定された運転周波数を有する制御信号をインバータ駆動部２５に出力する。

【０００６】即ち、図６（ａ）に示したように、使用者が庫内温度Ｔｓを０℃に設定する（ＳＴ２）と、前記マイクロコンピュータ２９は、所定時間ｔ１の間、最大運転周波数７５Ｈｚに該当する回転数に圧縮機１３モータを回転させる（ＳＴ３）。その後、前記マイクロコンピュータ２９は、冷凍室温度検出器３から検出された庫内検出温度Ｔｄと、庫内設定温度Ｔｓ間の温度差ＴＤを求め（ＳＴ４）て、例えば、温度差ＴＤが１℃以上であると、前記予め作成された探り表から、図６（ｂ）に示したように、前記１℃の温度差に該当する運転周波数６０Ｈｚを求め、該決定された運転周波数６０Ｈｚに該当する回転数で所定時間ｔ１～ｔ２の間圧縮機モータを回転させる。

【０００７】このように圧縮機のモータが動作される間、前記マイクロコンピュータ２９は、前記温度差ＴＤを求める過程を繰り返して、該温度差ＴＤに該当する運転周波数を前記予め作成された探り表から求め、該決定された運転周波数に該当する回転数で圧縮機モータを回転させる過程を継続する（ＳＴ５）と同時に、ファンモータ駆動部を制御してファンモータを回転させる。

【０００８】このようにして、使用者により設定された庫内温度を維持してインバータ冷蔵庫を動作させる。

【０００９】

【発明が解決しようとする課題】然るに、このような従来のインバータ冷蔵庫の運転制御方法においては、冷蔵庫内に投入される負荷量及び使用者により設定された負荷量に従い、実際に維持すべき温度に関わらず、庫内検出温度Ｔｄと庫内設定温度Ｔｓ間の温度差ＴＤに該当する運転周波数（探り表に予め設定されてある）のみに基づいて圧縮機モータの回転数を決定しているため、圧縮機の動作時に発生する騒音が大きく、電力の消耗が大きいという不都合な点があった。

【００１０】即ち、温度が高く、大きさが大きく、量の多い負荷に対して、圧縮機モータが動作して冷蔵庫内の温度を低下させると、前記負荷の温度は、外方側から漸次減少する。このとき、前記負荷の内部温度が使用者により設定された温度まで降下される前に、温度検出器から前記使用者設定温度と同様になる前記負荷の外方側の温度を検出してマイクロコンピュータに出力すると、該マイクロコンピュータは圧縮機モータを停止させる。

【００１１】且つ、時間の経過に従い、前記負荷内に潜む高温の熱が漸次外部に伝達されて、庫内温度が上昇すると、温度検出器は、該庫内温度を検出して、マイクロコンピュータに出力し、該マイクロコンピュータは、前記庫内検出温度と、使用者設定温度と、を比較して、該温度差に該当する運転周波数で圧縮機モータを再び回転させていた。

【００１２】又、冷蔵庫内に投入される食品の内部熱量を考慮せずに、温度検出器からの庫内検出温度に基づいて圧縮機モータの運転周波数を決定しているため、冷蔵庫への食品の投入無しに冷蔵庫ドアーを開閉する場合にも、最大周波数で圧縮機モータを回転させるようになって、動作騒音及び消耗電力が増大するという不都合な点があった。

【００１３】更に、使用者設定温度が高く設定されている場合は、低い運転周波数で圧縮機モータをオン／オフさせるべきであるため、電力消耗が大きく、投入された食品の内部までに低温を維持しようとすると、長時間が所要されて、食品を長期間保管する場合は、食品が変質する恐れがあるという不都合な点があった。そこで、本発明は、このような従来の課題に鑑みてなされたもので、その目的は、冷蔵庫内に投入された負荷に従い、圧縮機モータの動作パターンを検出して圧縮機モータの運転周波数を決定し、該運転周波数で圧縮機モータの回転を制御するインバータ冷蔵庫の運転制御方法を提供する

ことにある。

【0014】

【課題を解決するための手段】このような目的を達成するため、本発明に係るインバータ冷蔵庫の運転制御方法においては、冷蔵庫ドアーの開閉を検出して予め設定された所定の運転周波数ｆａを有する制御信号で圧縮機モータを動作させる第１段階と、圧縮機モータの動作時に、圧縮機モータのオン／オフパターンを検出して圧縮機モータの運転周波数ｆｄを決定する第２段階と、前記決定された運転周波数ｆｄを有する制御信号で圧縮機モータを動作させる第３段階と、を順次行うようになっている。

【0015】且つ、本発明に係るインバータ冷蔵庫の運転制御方法においては、庫内検出温度Ｔｄと、庫内設定温度Ｔｓと、を比較して、前記庫内検出温度Ｔｄが前記庫内設定温度Ｔｓよりも低いと、圧縮機モータの動作を停止させ、前記圧縮機モータのオフ時間ｔｄを検出する段階と、前記庫内検出温度Ｔｄと、庫内設定温度Ｔｓと、を比較して、前記庫内検出温度Ｔｄが前記庫内設定温度Ｔｓよりも高いと、前記検出された圧縮機モータのオフ時間ｔｄと、予め設定された圧縮機オフ時間ｔＯＦＦと、を比較する段階と、該比較結果、前記検出された圧縮機モータのオフ時間ｔｄが、前記予め設定された圧縮機オフ時間ｔＯＦＦよりも短いと、高周波の運転周波数ｆＨで圧縮機モータを回転させる段階と、前記比較結果、前記検出された圧縮機モータのオフ時間ｔｄが、前記予め設定された圧縮機オフ時間ｔＯＦＦよりも長いと、低周波の運転周波数ｆＬで圧縮機モータを回転させる段階と、を包含して行うようになっている。

【0016】

【発明の実施の形態】以下、本発明の実施の形態について図面を用いて説明する。本発明に係るインバータ冷蔵庫の運転制御装置は、図４に示した従来のインバータ冷蔵庫の運転制御装置と同様に構成されるため、説明を省略する。そして、本発明に係るインバータ冷蔵庫の運転制御方法においては、図１に示したように、インバータ冷蔵庫に電源が供給される（ＳＴ１０）と、使用者はキー入力部を利用して圧縮機モータのオフ時間ｔＯＦＦ及び庫内温度Ｔｓ（図２（ａ））を設定し（ＳＴ１１）た後、マイクロコンピュータ２９から冷蔵庫ドアーの開閉を検出し（ＳＴ１２）て、予め設定された高周波の運転周波数ｆＨ（例えば、図２（ｂ）に示したように６０Ｈｚ）に該当する制御信号をインバータ駆動部２５に出力し、前記高周波数ｆＨに該当する回転数で圧縮機モータを回転させる（ＳＴ１３）。

【0017】その後、庫内温度を低くくするため、圧縮機モータが動作すると共に、マイクロコンピュータ２９は、温度検出器から検出された庫内検出温度ｔｄと庫内設定温度ｔｓと、を比較し（ＳＴ１４）て、前記庫内検出温度ｔｄが庫内設定温度ｔｓよりも高いと、検出された圧縮機モータのオフ時間ｔｄと前記予め設定された圧縮機モータのオフ時間ｔＯＦＦと、を比較する（ＳＴ１５）。（このとき、圧縮機モータは、初期に高周波の運転周波数で回転し、庫内設定温度より低くなるまで継続して動作するため、圧縮機モータのオフ時間ｔｄと前記予め設定された圧縮機モータのオフ時間ｔＯＦＦと、を比較しないように設定するか、検出された圧縮機モータのオフ時間ｔｄを“0”に設定する）。

【0018】前記比較結果、検出された圧縮機モータのオフ時間ｔｄが前記予め設定された圧縮機モータのオフ時間ｔＯＦＦよりも短いと、高周波の運転周波数ｆＨで圧縮機モータを回転させ（ＳＴ１６）、検出された圧縮機モータのオフ時間ｔｄが前記予め設定された圧縮機モータのオフ時間ｔＯＦＦよりも長いと、低周波の運転周波数ｆＬで圧縮機モータを回転させる（ＳＴ１７）。

【0019】このように圧縮機モータが動作されるとき、前記マイクロコンピュータ２９は、温度検出器から検出された庫内検出温度ｔｄと庫内設定温度ｔｓと、を比較して、前記庫内検出温度ｔｄが庫内設定温度ｔｓよりも低いと、圧縮機モータの回転をオフさせ（ＳＴ１８）、前記圧縮機モータがオフされた時間ｔｄを測定する（ＳＴ１９）。

【0020】そして、時間の経過に従い、前記庫内温度Ｔｄが使用者設定の庫内温度Ｔｓ以上に上昇する（ＳＴ１４）と、その時点以前までに測定された圧縮機モータのオフ時間ｔｄと、予め設定された圧縮機モータのオフ時間ｔＯＦＦと、を比較して、前記測定された圧縮機モータのオフ時間ｔｄが前記予め設定された圧縮機モータのオフ時間ｔＯＦＦよりも長いと、低周波の運転周波数ｆＬで圧縮機モータを回転させる（ＳＴ１７）。

【0021】即ち、図２（ａ）、（ｂ）に示したように、初期ｔ０に圧縮機モータは、高周波の運転周波数６０Ｈｚに該当する回転数で回転して庫内温度を低くし、庫内検出温度が設定温度よりも低い時点ｔ１で圧縮機モータの回転を停止する。その後、時間の経過に従い、庫内温度が再び設定温度よりも高くなると、時点ｔ２より再び圧縮機モータが回転する。このとき、前記マイクロコンピュータ２９は、圧縮機モータの運転周波数を決定するため、前記圧縮機モータのオフ時間ｔ１～ｔ２と、予め設定された圧縮機オフ時間ｔＯＦＦと、を比較した後、前記圧縮機モータのオフ時間ｔ１～ｔ２が圧縮機オフ時間ｔＯＦＦよりも短いため、冷蔵庫内の負荷量が大きいと判断して、再び高周波の運転周波数６０Ｈｚに該当する回転数でモータを回転させる。

【0022】このように、前記マイクロコンピュータ２９は、検出される圧縮機モータのオフ時間ｔ１～ｔ２、ｔ３～ｔ４、ｔ５～ｔ６が予め設定された圧縮機モータのオフ時間ｔＯＦＦよりも短いと、高周波の運転周波数６０Ｈｚで圧縮機モータを回転させ、検出される圧縮機モータのオフ時間ｔｄが予め設定された圧縮機モータの

オフ時間ｔＯＦＦ以上になる時点ｔ７からは低周波の運転周波数４０Ｈｚで圧縮機モータを回転させる。

【００２３】

【発明の効果】以上説明したように、本発明に係るインバータ冷蔵庫の運転制御方法においては、冷蔵庫内に投入された負荷に従い、圧縮機モータの動作パターン（圧縮機モータのオフ時間）を検出して圧縮機モータの運転周波数を決定し、該決定された運転周波数で圧縮機モータの回転を制御するため、庫内の負荷を考慮して圧縮機モータを最適状態に制御して、インバータ冷蔵庫の動作時に発生する騒音及び電力の消耗を低減し得るという効果がある。

【図面の簡単な説明】

【図１】本発明に係るインバータ冷蔵庫の運転制御方法を示したフローチャートである。

【図２】（ａ）は、本発明に係るインバータ冷蔵庫の運転制御方法による圧縮機モータの動作に従う庫内検出温度の変化を示したグラフであり、（ｂ）は、本発明に係るインバータ冷蔵庫の運転制御方法による圧縮機モータの運転周波数を示したグラフである。

【図３】一般のインバータ冷蔵庫の構成を示した概略断面図である。

【図４】一般のインバータ冷蔵庫の運転制御装置の構成を示したブロック図である。

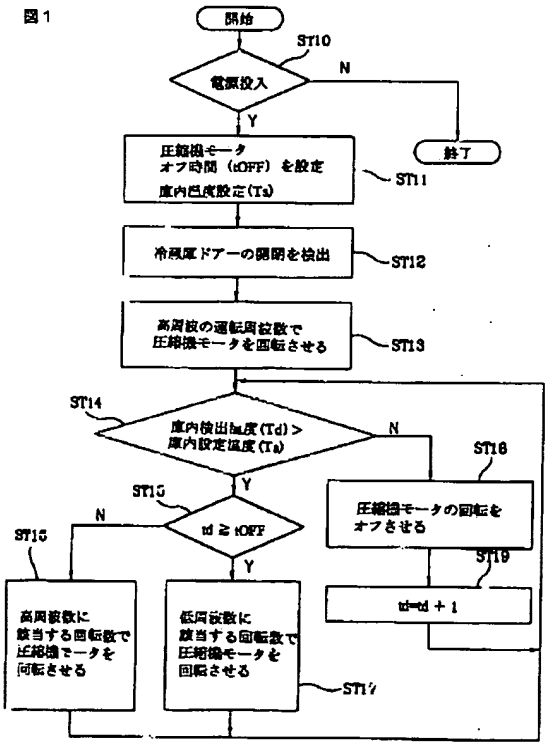
【図５】従来のインバータ冷蔵庫の運転制御方法を示したフローチャートである。

【図６】（ａ）は、従来の圧縮機モータの動作に従う庫内検出温度と庫内設定温度間の温度差を示したグラフであり、（ｂ）は、図６（ａ）の温度差に対応する圧縮機モータの運転周波数を示したグラフである。

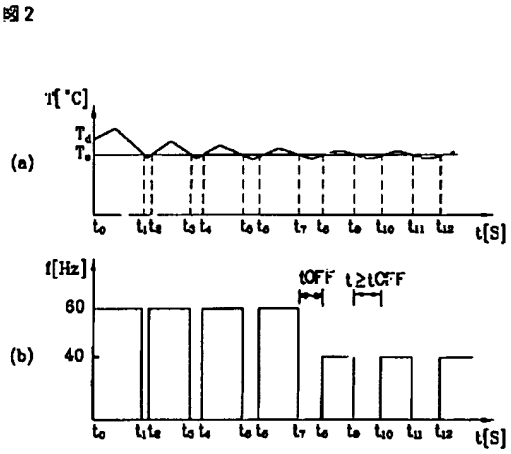
【符号の説明】

１…冷凍室
３…冷凍室温度検出器
５…ファンモータ
７…蒸発器
９…ダンパ
１１…冷蔵室温度検出器
１３…圧縮機
１５…冷蔵室
２１…キー入力部
２３…ファンモータ／ダンパ駆動部
２５…インバータ駆動部
２７…圧縮機駆動部
２９…マイクロコンピュータ

【図１】

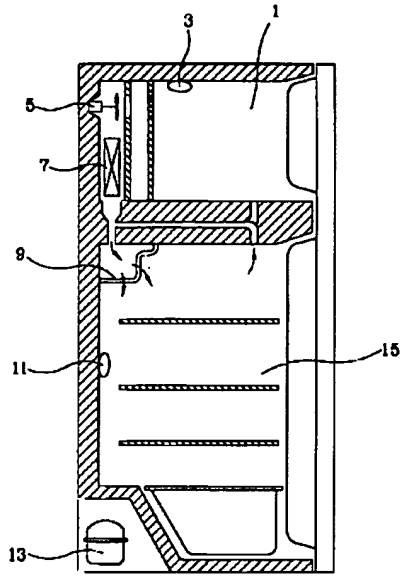


【図２】



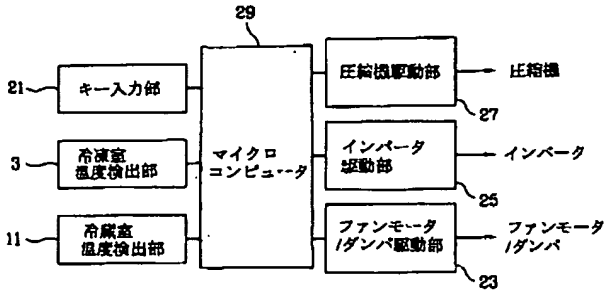
【図3】

図3



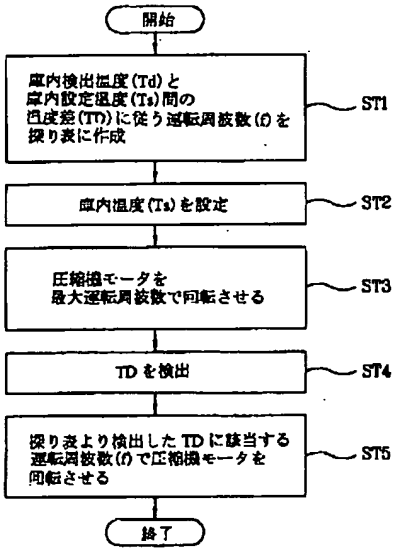
【図4】

図4



【図5】

図5



【図6】

図6